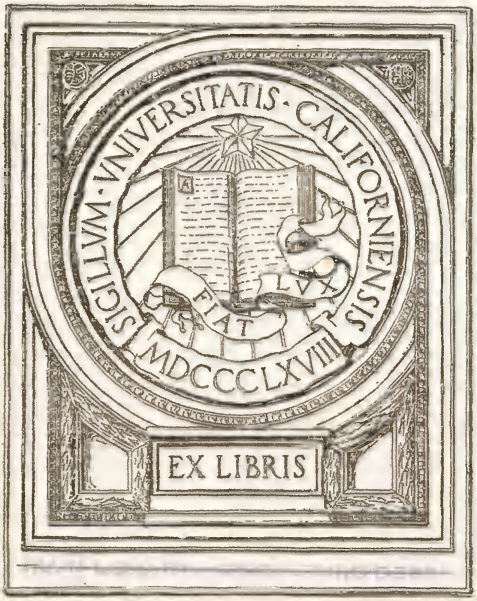

BULLETIN 1 APRIL 1912

DESTRUCTIVE INSECTS OF INYO COUNTY

BY

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Bishop, California

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E. J. Wickson

DESTRUCTIVE INSECTS OF INYO COUNTY

Inyo County is fortunate in being free from many insect pests which are ravaging the orchards in other localities. Those which are found here and described in this bulletin are the only ones which as yet have levied a heavy tax on the products of our orchards and fields. The Owens River Valley, the main horticultural region, shut off as it is by the natural mountain barriers, has an exceptionally good opportunity to keep out insect invaders from infected localities. A thorough inspection of all nursery stock imported into the county, together with the hearty co-operation of all growers in reporting any outbreak of new pests, will make it possible to prevent their establishment and spread. It is perfectly possible to get rid of the pests which we now have, if the growers will all take an active interest in the eradication of the insects found in their own orchards, and if they will insist on the neighbors doing the same.

At the request of several growers, and for the benefit of those who are not familiar with the habits and control methods of insects, the Board of Supervisors has allowed the publication of this bulletin. Only the most common insects are described, and the simplest and most effective spray formulae are given. Much that is technical and unsuited to this locality is purposely omitted. I have drawn freely upon the publications of the State Horticultural Commission and State Experiment Stations and others for much of the material found in this bulletin.

TYPES OF INSECTS

In order to know how to kill the insects it is absolutely necessary to learn how they do their damage. Insects are separated into two great divisions, those with biting and those with sucking mouth parts. The biting insects, like the codling moth worms, grasshoppers, etc., take portions of the plant directly into their stomachs by a process similar to our own eating habits, only their jaws work sideways.

The sucking insects, like the plant lice, squash bugs, scales, etc., insert a sort of a beak into the tissues of the plants and extract the essential juices. The biting insects can be controlled by placing some poison on the parts they devour; the sucking insects are not at all influenced by poisons, but must be covered with some irritants, sprays, either as dust or in liquid form, which kill by contact, either corroding the bodies or stopping up the breathing organs.

Insects Attacking the Apple

Codling Moth (Carpocapsa pomonella);
San Jose Scale (Aspidiotus perniciosus);
Red spider (Bryobia pratensis);
Woolly aphis (Schizoneura lanigera);
Green apple aphis (Aphis mali).

Insects Attacking the Peach

San Jose Scale (Aspidiotus perniciosus);
Green Peach Aphis (Myzus persicae);

Insects Attacking the Pear

San Jose Scale (Aspidiotus perniciosus);
Codling Moth (Carpocapsa pomonella).

Other Pests

Flat-headed Borer (Saperda candida),
Eel Worm (Heterodera radicicola).
Squash Bug (Anasta tristis);

THE CODLING MOTH

There is no insect which does more injury to the orchardist than the codling moth or apple worm. It attacks the apple, pear and often the quince. There are two broods in a season. The first develops from worms which have wintered over in protected places, under the loose bark on the trees or in the ground. The moths of the first brood begin to emerge in April, but very few eggs are laid before May. Egg-laying may then be continued till June or later, depending on the weather. The eggs of the first brood are deposited usually on the smooth surface of the leaves. After the worms hatch they crawl over the young fruit and begin to feed at the blossom end or calyx. The calyx cups close soon after the petals of the flowers drop, so it is advised by the best authorities to spray as soon after the falling of the blossoms as possible, in order to leave a deposit of poison there.

The full-grown worms of the first generation emerge from the fruit in the middle of summer and seek some hiding place. In a short time they pupate, then emerge as the moths of the second brood.

In late July or early August these moths lay their eggs on the surface of the leaves, or fruit, the point of contact between two apples being a favorite place. The eggs are disc shaped, about the size of a pinhead, and almost transparent. In about ten days they hatch, and the worms begin to crawl about in search of some fruit, into which they may enter. The short space of time between the hatching or the eggs

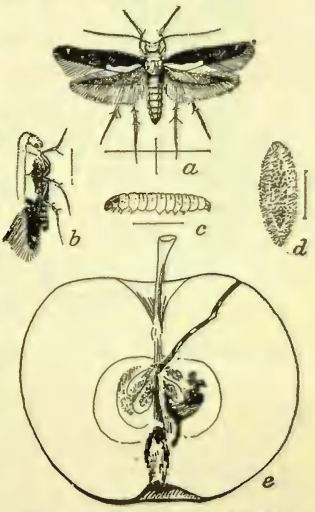
and the entrance into the fruit is the only time that spraying is effective. As the codling moth is a biting insect, we must give it a stomach poison. Lead arsenate is the best material to use.

When to Spray

The first spraying should be done just after the blossoms fall. Use a rather coarse nozzle and spray downwards directly in the blossom end of the young apple. Use an angle nozzle or bend the pipe. In order to reach the tops of the tall trees you may have to mount a tower on the wagon, or extend the spraying pole.

The second spraying should be done about ten days later, to catch the worms that hatch later or irregularly. The third spraying is for the second brood of "worms," which enter the apple through the side. This is due about the first of August. A thorough application on the whole surface of the fruit and leaves is necessary. Use a mist spray, being careful not to drench the tree so as to make the fine drops run together and drip. A spraying in September is advisable, though not necessary in most places.

Of all the sprayings the first and the third are the most important, but they must be thoroughly done. From 90 to 98 per cent of the fruit will be free from the worm if the above schedule is carried out consistently, even if the insect is very abundant in your neighbor's orchard.



(Fig. 1.) CODLING MOTH
a—Moth, with wings spread.
b—With wings folded.
c—Larva or worm.
d—Pupa.
e—Apple cut to show work of the worm.
[U.S. Dept. Agriculture

What to Spray With

Use 2 lbs. of lead arsenate in each 50 gallons of water. First mix with 2 gallons of water, then dilute. A good agitator in the spray tank is essential to insure a thorough and uniform mixture of the poison and water. Count on using from two to nine gallons of spray on a tree for each application. [The material is sold by Rowan & Johnson, at a low figure—13½ cents a pound.]

SAN JOSE SCALE

DESCRIPTION—This scale belongs to the sap-sucking type of insects. In its youngest stage the insect looks like a tiny, yellow louse, which crawls over the tree in search of a suitable place to locate for the rest of its life. The young insect appears about May here. It spreads to

other trees at this stage, carried by the winds or on the feet of birds. As soon as established it forms a scale covering over itself by the secretions of special glands, and after molting loses its legs.

The San Jose scale, like the woolly aphis, injects a poison into the bark of the tree, there causing a red discoloration which can be readily seen on cutting the bark. The scale may be present in so great numbers as to form a continuous crust over the branches, and give the bark an ash-colored appearance.

Fig. 2. SAN JOSE SCALE on apple. [Cal. Hort. Com.

It also attacks pears, peaches and plums, as well as the currant.

How to Control It

In badly infected trees two applications of lime-sulphur are necessary; one in the fall, just after the leaves fall, the second in the spring before the buds open. In slightly affected trees, the second spraying alone will be sufficient. The spray as applied should read 4.5 degrees on the Beaume scale or 1.03 degrees on the hydrometer scale. Every grower should have this inexpensive tester.

RED SPIDER

The red spider is a mite which extracts the essential juices of the leaves, causing them to become pale yellow. As a result the fruit fails to mature properly, and often falls. The mite winters over as a bright red egg deposited on the bark. Trees badly infected may have their branches thickly covered on the sheltered sides with these red egg masses. About April a tiny red spider, scarcely visible to the naked eye, hatches from the egg and crawls toward the young foliage. At this time it has six legs, later it molts and has eight; its color is also changed somewhat.

How to Control It

The egg masses are most satisfactorily destroyed by spraying with the commercial soluble oil sprays, applied during the winter. After they hatch, the sulphur sprays do the most efficient work, ten pounds of sulphur in fifty gallons of water. The agency of the sun is a most important factor in the use of the sulphur spray, as the element which does the destruction is the sulphur fumes. In order to make the sulphur mix better and adhere to the leaves and bark add a little soap, about one-half pound in fifty gallons. The sulphur treatment prevents the development of the mites. Within a week or so, if the spraying has been done thoroughly, the pest will disappear. A weak

solution of lime-sulphur, one part lime-sulphur to forty parts water, is recommended by some authorities. The same treatment is advised for the mite which destroys the foliage of the locust trees.

WOOLLY APHIS

DESCRIPTION—The woolly aphis is a small blue-gray louse, more or less covered with a white, waxy, woolly material which gives it its name. Unlike most plant lice, it attacks both the roots and branches of the apple tree. The damage done by this pest consists of irritating the tissues of the plant by injecting a sort of a poison which results in the development of galls and warts. On the roots, these galls frequently interrupt the flow of sap and cause decay. The tops are also stunted in the same way. In addition to poisoning, a large quantity of sap may be withdrawn, so taxing the vitality of the tree, and the sticky honey dew excreted mars the leaves and fruit. The aphids spend the winter mostly under ground on the roots, though some may find shelter under loose bark. When the warm days come, about March, the aphids multiply rapidly and crawl upon the branches and twigs above. In the summer winged individuals appear that spread the pests from tree to tree.

How to Control It

For the insect below ground, dig out a basin three or more feet wide, at the base of the tree, and fill with wood ashes. The lye contained in the ashes will leach down when water is applied, and kill the aphis. Other remedies are tobacco solutions or dust, in place of the ashes.

For the insect on the branches, spray with strong kerosene emulsion whenever the pest appears. Distillate is a little better, but unfortunately difficult to get here. (See formulae). This insect is very persistent and requires constant attention. It is attacked by many of the ladybird beetles, and care should be taken not to injure these valuable friends.

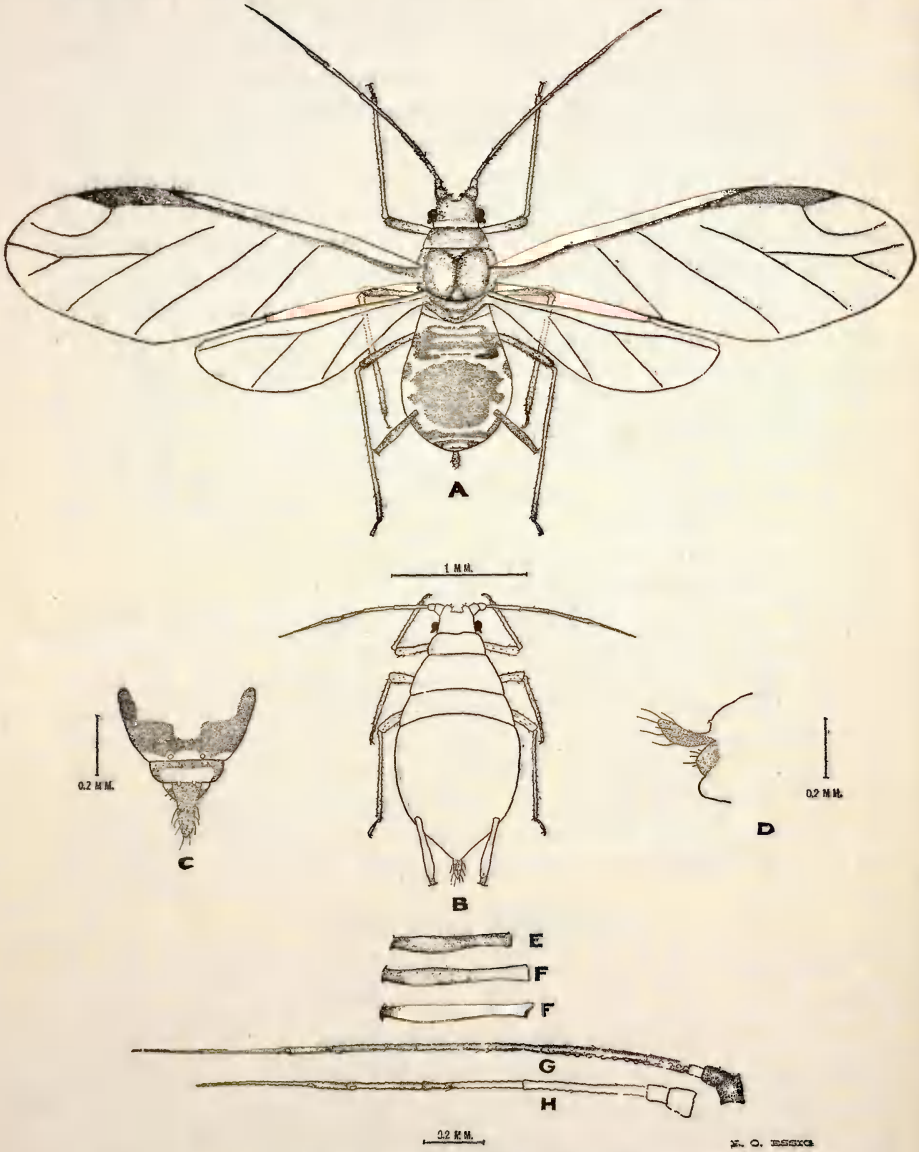
THE GREEN APPLE APHIS

The treatment of the louse which attacks the leaves of the apple is essentially the same as for the green peach aphis, which see.

THE GREEN PEACH APHIS

HOW IT LIVES—The winter is spent in the egg state, or in the adult tate if the weather is not too severe and if there are some green plants on hand upon which they may hibernate. The eggs are small, black and well hidden in wrinkles or depressions close to the buds. They hatch about the middle of February and give rise to a rather large pink louse known as the stem-mother, from which the later generations spring.

She soon gives birth to smaller and lighter green lice, which suck the sap around the base of buds. In the summer the insects increase



GREEN PEACH APHIS (Myzus persicæ)

A, winged viviparous female; B, anterous viviparous female; C, pygidium of winged female, dorsal aspect; D, pygidium of apterous female, lateral aspect; E, cornicle of winged female; F, cornicle of apterous female; G, antenna of winged female; H, antenna of apterous female.—(After E. O. Essig in P. C. Jr. Ent.

rapidly; occasionally a brood with wings is formed, which spreads the pest to other trees. The last brood lays the eggs which winter over. The aphis attacks the blossoms first, but as soon as the leaves unfold it changes its feeding place. As the result the leaves begin to curl and frequently drop, thus weakening the tree, which makes an extra effort to reestablish its foliage at the expense of the fruit. A fungous disease (Exoascus deformans), which also curls the leaves and is ordinarily known as "the curl leaf," is often confused with the curling of the leaf caused by the aphis. As a consequence of the mistake, many growers have, with no beneficial results, used on the green aphis a spray meant for the fungous disease.

How to Control It

The eggs can be destroyed by an early spraying with lime-sulphur. After they hatch use the whale-oil soap spray, or the kerosene emulsion. The addition of tobacco to either makes the spray more efficient, and is advised.

MISCELLANEOUS

FOR FLAT-HEADED BORERS—Injury from the flat-headed borer, which so often attacks young apple trees, can be avoided by protecting the south and southwest sides of the tree from sunburn. It does not attack uninjured trees. The regular tree protectors now on the market are excellent. A coating of white wash containing some soap and sulphur is also good. On removing a borer smear the wound with paint or grafting wax.

FOR SUNBURN—Head the tree low. Whitewash the trunks up to the first large branches.

THE POTATO EEL WORM

Plant only clean seed, on soil free from the pest. As an extra precaution to destroy any nematodes present in adhering soil, dip the seed in a solution of formalin, one pound to ~~32~~ 32 gallons water. This will also kill any scab fungus on the potato. Avoid carrying any soil from an infested field into new ground on any machine or tool used. Infested fields should be plowed deeply and fallowed one or two years. In case that is not practicable, plant to one of the following crops, which are seldom affected by the eel worm:

Barley, oats, wheat, rye, corn, sorghum, milo, kafir, timothy, red top or peanuts.

For further information on the Eel Worm, send for Circular 91, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C. It costs five cents.

THE SQUASH BUG

These insects attack many varieties of fruits and especially vegetable crops. They have a strong sharp beak which they insert into the plant tissues and suck out the sap, making the plant wilt and die. They spend the winter as adults in weeds, straw, old fences, etc.

How to Control It

Keep the field clear of anything which will attract the bugs in winter. Put out piles of straw, and when they collect, burn. Or lay shingles near the vines, and destroy the insects when they crawl under to hide. Hand picking or knocking into a pan containing coal oil is perhaps the quickest way. The egg masses, easily seen on the underside of the leaf, should be destroyed. Lime or ashes spread on the leaves may help. Spraying is not recommended, except when the insect is young. Then use kerosene emulsion.

USEFUL PUBLICATIONS

The State Commission publishes monthly a bulletin of general information on various horticultural interests. It is free to all who ask for it. Address State Horticultural Commission, Sacramento, Cal.

The Agricultural Experiment Station, at Berkeley, Cal., publishes from time to time bulletins on various subjects. Ask to be put on the mailing list.

The County Horticultural Commissioner has in his office many publications and books relating to orchard management, spraying, insect pests, plant diseases, etc., and will be glad to loan same to those who are interested.

SPRAY FORMULAE

1. Lead Arsenate:

Lead arsenate, 6 to 10 pounds; Water, 200 gallons.

First mix lead arsenate with two or three gallons of water, then dilute. Have a good agitator in spray tank.

For codling moth and all insects which bite their food.

2. Paris Green:

Lime, 5 pounds; Paris Green, 1⅓ pounds; Water, 200 gallons.

A good agitator is absolutely necessary.

For codling moth and other biting insects. The lead arsenate is preferable, as it does not burn the leaves.

3. Lime Sulphur:

Quicklime, 33 pounds; Sulphur, 66 pounds; Water, 200 gallons.

Sift sulphur through box with screen bottom into boiling tank with 50 gallons of water. Add the lime and boil 45 minutes to one hour. Stir frequently. Strain through cheese cloth or burlap and dilute to make 200 gallons. If extra lime is desired strain in milk of lime when spray is ready for use.

4. Commercial Lime Sulphur:

The standard strength corresponding to the above formula is obtained when commercial solution is diluted 1 to 9; 4.5° Beaume tester.

Either of the above for San Jose and other armored scales to be applied during dormant season, preferably in early winter or early spring. For Peach Moth as the buds are expanding in the spring.

5 Distillate.

A 28° gravity oil refined for tree use.

Distillate, 12 gallons; Water, 200 gallons.

For use only with power sprayer with good agitator, which is necessary to make a mechanical mixture of the oil and water.

For the Brown Apricot, Black, and other unarmored scales, and for Woolly aphis, to be applied during dormant season, preferably in early winter.

6. Kerosene Emulsion:

Soap, ½ pound; Kerosene, 1 gallon; Water, 10 to 25 gallons.

Dissolve soap in 1 gallon hot water. Add 1 gallon Kerosene. Mix thoroughly with spray pump by turning nozzle back into mixture.

For plant lice and other sucking insects during growing season, dilute with 20 to 25 gallons of water.

For Scale insects, Wooly Aphis and other sucking insects during dormant season, dilute with 10 gallons of water.

Kerosene emulsion can be used on a small scale with hand sprayer.

7. Whale Oil Soap:

Whale oil soap, 1 pound; Water, 6 to 12 gallons.

Ordinary laundry soap may be substituted.

For plant lice.

8. Tobacco:

Tobacco stems, 1 pound; Water, 4 gallons.

Steep Tobacco in 1 gallon hot water, then dilute to 3 or 4 gallons. Or

Black leaf extract, 1 gallon; Water, 60 to 70 gallons.

Black leaf 40 per cent, 1 pint; Water, 120 gallons.

For plant lice and other sucking insects. This may be added to either No. 6 or No. 7.

9. Sulphur:

Flowers of Sulphur, 45 pounds; Soap, 2 pounds; Water, 200 gallons.

Dissolve the soap in hot water before mixing. No cooking is required. Apply with a rather coarse nozzle.

10. Miscible Oils:

Commercial preparations, to be used according to directions.

For Scale, Wooly Aphis and other sucking insects, to be applied when trees are dormant.

COST OF SPRAYING MATERIALS

(at Bishop)

Lead arsenate, per pound	13½ cents
Paris green, per pound	45 cents
Whale-oil soap, per pound	12½ cents
Tobacco (Blackleaf 40 pr ct), in 2½-lb cans	$ 3.75
Bluestone, per ponnd	10 cents
Flowers of sulphur, per pound	5 cents
Lime-sulphur, per barrel	$13.50
Formalin (40 pr ct) for smut and potato scab per pound	50 cents

NOXIOUS WEEDS

The worst weed pest that exists in Inyo county is Johnson grass. As yet it has not spread extensively, it being confined mainly to localities where it was originally planted. Some have eradicated it; some have made no effort whatever, evidently waiting for the pest to make more headway before they give it any attention. Unless we check the pest, every year will see new localities infested. Now is the time to stop its spread and to get rid of it. Don't let it go to seed!

Johnson grass has been eradicated successfully in many places within two years by the following method:

IN SMALL PATCHES—Cut the grass short, just before it goes to seed. Plow and turn in hogs to eat up the root stock.

IN PASTURES—Sheep and goats will keep the grass cropped close. This will prevent the growth of the root stalks and tend to bring them close to the surface. A shallow plowing will tear them up. Gather with a harrow and burn.

The wild morning glory vine is more difficult to control, but will yield in time.

First—Don't allow it to go to seed.

Second—Cultivate infested ground once a week and don't allow the vine to show above the surface. Starve it out.

LOVE VINE, OR DODDER

This orange-colored parasite so often found in alfalfa fields belongs to the morning glory family of plants, but unlike its relative leaves its roots soon after germination, and absorbs its nourishment from the host plant. Cut by hand all plants attacked before the pest goes to seed, and burn all.

Before planting alfalfa make sure the seed is free from love vine. Its presence can be detected by the aid of a magnifying glass.

COCKLE-BURR

Prevent it from seeding.

AN ACT

To Amend Section 2322 of the Political Code of the State of California to read as follows:

SECTION 2322a. It shall be the duty of the County Horticultural Commissioner in each county, whenever he shall deem it necessary, to cause an inspection to be made of any premises, orchards or nursery, or trees, plants, vegetables, vines, or fruits, or any fruit packing-house, store-room, sales-room, or any other or article in his jurisdiction, and if found infected with infectious diseases, scale, insects, of codling moth, or other pests injurious to fruits, plants, vegetables, trees or vines, or with their eggs, or larvae, or if there is found growing thereon the Russian Thistle or Saltwort, Johnson Grass, or other noxious weeds, he shall (in writing) notify the owner or owners, or persons in charge, or in possession of said places or orchards or nurseries, or trees, or plants, vegetables, vines or fruit, or articles as aforesaid, that the same are infested with said diseases, insects or other pests, or any of them, or their eggs or larvae, or that the Russian Thistle or Saltwort, Johnson Grass, or other noxious weed, is growing thereon, and require some person or persons, to eradicate or destroy said insects, or other pests, or their eggs or larvae, or Russian Thistle or Saltwort. Johnson Grass, or other noxious weeds within a certain time therein specified. Said notices may be served upon the person or persons, or either of them, owning or having charge, or having possession of such infested orchards or place, or nursery, or tree, plants, vegetables, vines or fruit, or articles, as aforesaid, or premises where the Russian Thistle or Saltwort, or Johnson Grass, or other noxious weeds shall be growing, or upon the agents of either, by any commissioner, or by any person deputed by the said commissioner for that purpose in the same manner as a summons in a civil action; (provided, however, that if) any such infected or infested articles, property or premises as hereinabove specified belong to any non-resident person and there is no person in control or possession thereof and such non-resident person has no tenant, bailee, depositary or agent upon whom service can be had; or (if) the owner or owners of any such articles, property or premises cannot after due diligence be found, then such service may be served by posting the same in some conspicuous place on such articles, property or premises, and by mailing a copy thereof to the owner thereof at his last known place of residence, if the same is known or can be ascertained. . . . Any and all such places, or orchards, or nurseries, or trees, plants, shrubs, vegetables, vines, fruit or articles thus infested, or premises where the Russian Thistle or Saltwort, or Johnson Grass, or other noxious weeds shall be growing, are hereby adjudged and declared to be a public nuisance: and whenever such nuisance shall exist at any place within this county, and a proper notice thereof shall have been served, as herein provided, and such nuisance shall not have been abated within the time specified in said notice, it shall be the duty of the county horticultural commissioner to cause such nuisance to be at once abated, by eradicating or destroying such diseases, insects, or other pests, or their eggs, or larvae, or Russian Thistle or Saltwort, or Johnson Grass, or other noxious weeds.

The expense thereof shall be a county charge, and the Board of Supervisors shall allow and pay the same out of the general fund of the county. Any and all sum or sums so paid shall be and become a lien on the property and premises from which said nuisance has been removed or abated in pursuance of this chapter. A notice of such lien shall be filed and recorded in the office of the County Recorder of the county in which said property and premises are situated, within 30 days after the right to said lien has accrued. An action to foreclose such lien shall be commenced within ninety days after the filing and recording of said notice of lien, which action shall be brought in the proper court by a district attorney of the county in the name and for the benefit of the county making such payment or payments, and when the property is sold, enough of the proceeds shall be paid into the county treasury of such county to satisfy the lien and costs; and the overplus, if any there be, shall be paid to the owner of the property, if he be known, and if not, into the court for his use when ascertained. The county horticultural commissioner is hereby vested with the power to cause any and all such nuisances to be at once abated in a summary manner.

Watch out for the

ALFALFA WEEVIL

Report any strange insect to the
County Horticultural Commissioner

SPRAY CALENDAR

What to Spray	For What to Spray	With What to Spray	WHEN TO SPRAY		Remarks
			First Spraying	Second Spraying	
Apple	Codling moth	Lead arsenate, 2 lbs to 50 gal.	As soon as blossoms fall	10 to 12 days later	Third spraying last week in July.
	San Jose scale	Lime-sulphur, 4.5° Beaume.	Late in fall or	Early in spring	In case of bad infestation spray twice.
	Green aphis	Whale-oil soap solution; add tobacco.	On appearance of the aphis before leaves curl		
	Woolly aphis	Kerosene emulsion.	When leaves are out	When it appears	
	Red spider	Sulphur; see No. 9.	April 1st	On appearance	Put wood ashes around base of tree for root form.
Cherry	Slug	Lead arsenate.	When it appears		
Currant	San Jose scale	See apple.			
	San Jose scale	See apple.			Throw dust or slaked lime on Cherry slug.
Peach	San Jose scale	See apple.			
	Green aphis	Lime-sulphur in winter; whale-oil soap and tobacco in spring.	Before the buds open	When it appears	
Pear	San Jose scale	See apple.			
	Codling moth	See apple.			
	Blister mite	Kerosene emulsion.	When buds begin to to swell in spring	When leaves have fallen in autumn	
Plum	San Jose scale	See apple.			
	Aphis	Whale-oil soap solution.			Use 1 lb soap to 6 gals water.
Potatoes	Dry rot	Dip seed in bluestone or formaldehyde sol'tn			
	Eel worm	Use clean seed.			
Rose	Aphis	Whale-oil soap solution	On appearance of the aphis		
Squash	Squash bug	Hand picking.			Pick bugs and egg masses from leaves. Trap bugs by laying shingles between vines and collecting insects the following morning,
Wheat	Smut	Dip in bluestone solution, 1 lb 24 gal water for 12 hours; then dry.			

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